

09/35, 027

**WHAT IS CLAIMED IS:**

sub 1

1. A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

- (a) examining at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) when an error is detected deriving, based on the error, a corrected drive pattern different from the target drive pattern such that use of the corrected drive pattern results in a reduced discrepancy between the target and actual array patterns.

sub 2  
C1

2. A method according to claim 1, additionally comprising operating the deposition apparatus according to the corrected drive pattern.

3.

A method according to claim 1 wherein the probes are DNA or RNA probes

dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array; and  
the drive pattern controls operation of the transport system.

8. A method according to claim 1 wherein:

the deposition apparatus includes a dispensing head to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;  
the drive pattern controls operation of the transport system; and  
the operating parameter is the position of the substrate or dispensing head, which is examined by viewing the substrate or dispensing head.

9. A method according to claim 8 wherein the operating parameter is examined by viewing a fiducial mark on the dispensing head or substrate

10. A method according to claim 1 wherein:

the deposition apparatus includes a dispensing head with multiple nozzles to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;  
the drive pattern controls operation of the transport system;  
the operating parameter is the position of the substrate or dispensing head, or orientation of a nozzle, and is examined by viewing the substrate, dispensing head, or nozzle, or a droplet pattern previously dispensed from the head.

11. A method according to claim 7 additionally comprising saving the target drive pattern in a memory of the deposition apparatus, and wherein the corrected drive pattern is saved in the memory, prior to operating the dispensing head and transport system to form the array.

12. A method according to claim 7 additionally comprising saving the target drive pattern in a memory of the deposition apparatus, and wherein the corrected drive pattern is derived by modifying, based on the detected error, instructions to at least one deposition apparatus component based on the target drive pattern during operation of the dispensing head and transport system to form the array.

13. A method according to claim 1 wherein the at least one parameter is the position of the substrate in the deposition apparatus.

14. A method according to claim 7 wherein the at least one parameter is a position of the dispensing head.

15. A method according to claim 7 wherein the deposition apparatus further includes a position encoder to detect the position of the dispensing head or the substrate, and wherein the at least one parameter is the accuracy of the encoder.

16. A method according to claim 7 wherein the at least one parameter is the accuracy in an ability of the transport system to move the substrate to an expected location in response to a command.

17. A method according to claim 7 wherein the dispensing head has multiple droplet dispensing nozzles, and wherein the at least one parameter is a position of a nozzle.

18. A method of fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern using a deposition apparatus which, when operated according to a target drive pattern based on nominal operating parameters of the apparatus and which is stored in a memory of the deposition apparatus, provides the probes on the substrate in the target array pattern, the method comprising:

when an error from a nominal value exists in at least one operating parameter, which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited then deriving, based on the error, a

Sub  
App  
Preliminary  
corrected drive pattern from the target drive pattern such that use of the corrected drive pattern results in a reduced discrepancy between the target and actual array patterns.

19. A method according to claim 18 wherein the corrected drive pattern is saved in the memory.

20. A method of fabricating an addressable array of biopolymer probes on a substrate carrying at least one fiducial mark, using a fabrication apparatus which includes a dispensing head to dispense fluid droplets containing the probes or probe precursors, the method comprising observing the at least one fiducial mark and, based upon the observation, rotating the substrate to a predetermined angular relationship with respect to the dispensing head.

21. An apparatus for fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern which apparatus, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern, the apparatus comprising:

- (a) a sensor which senses at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited;
- (b) a processor which, when an error is detected by the sensor derives, based on the error, a corrected drive pattern different from the target drive pattern such that use of the corrected drive pattern results in a reduced discrepancy between the target and actual array patterns.

22. An apparatus according to claim 21 additionally comprising:  
a dispensing head to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;  
and wherein:

the drive pattern controls operation of the transport system;

the operating parameter is the position of the substrate or dispensing head, and the sensor views the substrate or dispensing head to obtain its position.

23. An apparatus according to claim 22 wherein the sensor views a fiducial mark on the dispensing head or substrate

24. An apparatus according to claim 21 additionally comprising:  
a dispensing head with multiple nozzles to dispense fluid droplets containing the probes or probe precursors, and a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;  
and wherein:

the drive pattern controls operation of the transport system;

the operating parameter is the position of the substrate or dispensing head, or orientation of a nozzle; and

the sensor views the substrate, dispensing head, or nozzle, or a droplet pattern previously dispensed from the head.

25. An apparatus according to claim 21 additionally comprising a memory accessible by the processor to save the target drive pattern, and wherein the processor, when no error is detected, causes the apparatus to operate in accordance with the target drive pattern.

26. An apparatus according to claim 21 comprising a memory accessible by the processor to save the target drive pattern, and wherein the processor:

when no error is detected, causes the apparatus to operate in accordance with the target drive pattern; and

when an error is detected and a corrected drive pattern derived by the processor, saves the corrected drive pattern is saved in the memory.

27. An apparatus according to claim 21 wherein the processor derives the corrected drive without obtaining a target drive pattern.

28. An apparatus according to claim 21 additionally comprising:  
a dispensing head to dispense fluid droplets containing the probes or probe precursors;  
and  
a transport system to move at least one of the dispensing head and substrate relative to the other as the droplets are dispensed from the head, so as to form the array;  
and wherein the processor controls operation of the transport system in accordance with one of the drive patterns.
29. An apparatus according to claim 28 wherein the processor saves the target drive pattern in the memory, and saves the corrected drive pattern in the memory prior to operating the dispensing head and transport system to form the array.
30. An apparatus according to claim 21 additionally comprising a memory accessible by the processor, wherein  
the processor saves the target drive pattern in a memory of the deposition apparatus; and  
the processor derives the corrected drive pattern by modifying, based on the detected error, instructions to at least one apparatus component based on the target drive pattern during deposition of the probes to form the array.
31. An apparatus according to claim 25 wherein the at least one parameter is the position of the substrate in the deposition apparatus.
32. An apparatus according to claim 28 wherein the at least one parameter is a position of the dispensing head.
33. An apparatus according to claim 28 additionally comprising a position encoder to detect the position of the dispensing head or the substrate, and wherein the at least one parameter is the accuracy of the encoder.

34. An apparatus according to claim 28 wherein the at least one parameter is the accuracy in an ability of the transport system to move the dispensing head or substrate to an expected location in response to a command.

35. An apparatus according to claim 34 wherein the transporter moves the dispensing head or substrate along a corresponding nominal axis, and wherein the at least one parameter is the deviation of actual movement from the corresponding nominal axis.

36. An apparatus according to claim 28 wherein the dispensing head has multiple droplet dispensing nozzles, and wherein the at least one parameter is a position of a nozzle.

37. An apparatus for fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern, comprising

- (a) a memory to store a target drive pattern based on nominal operating parameters of the apparatus to provide the probes on the substrate in the target array pattern;
- (b) a processor to receive an indication of an error from a nominal value in at least one operating parameter, which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited, and to derive a corrected drive pattern from the target drive pattern such that use of the corrected drive pattern results in a reduced discrepancy between the target and actual array patterns.

38. An apparatus for fabricating an addressable array of biopolymer probes on a substrate carrying at least one fiducial mark, the apparatus comprising: a dispensing head to dispense fluid droplets containing the probes or probe precursors; a sensor to sense the position of the at least one fiducial mark on the substrate, and a transporter which based on the position of the at least one fiducial marked as sensed by the sensor, can rotate the substrate to a predetermined angular relationship with respect to the dispensing head.

39. An apparatus according to claim 37 wherein the corrected drive pattern is saved in the memory.

40. A computer program product, for use on an apparatus for fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern which apparatus, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern;

the program product comprising: a computer readable storage medium having a computer program stored thereon which, when loaded into a computer of the apparatus performs the steps of:

- (a) receiving a signal from a sensor which senses at least one operating parameter for an error from a nominal value which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited; and
- (b) when an error is detected by the sensor, deriving, based on the error, a corrected drive pattern different from the target drive pattern such that use of the corrected drive pattern results in a reduced discrepancy between the target and actual array patterns.

41. A computer program product according to claim 40, wherein the program additionally performs the step of operating the apparatus according to the corrected drive pattern.

42. A computer program product according to claim 41, wherein the program additionally performs the steps of saving the target drive pattern in a memory of the apparatus, and saving the corrected drive pattern in the memory prior to operating the apparatus according to the corrected drive pattern.

43. A computer program product according to claim 41 wherein the program additionally performs the steps of:  
saving the target drive pattern in a memory of the deposition apparatus; and  
deriving the corrected drive pattern by modifying, based on the detected error, instructions to at least one apparatus component based on the target drive pattern, during deposition of the probes to form the array.



44. A computer program product, for use on an apparatus for fabricating an addressable array of biopolymer probes on a substrate according to a target array pattern which apparatus, when operated according to a target drive pattern based on nominal operating parameters of the apparatus, provides the probes on the substrate in the target array pattern

the program product comprising: a computer readable storage medium having a computer program stored thereon which, when loaded into a computer of the apparatus performs the steps of:

- (a) storing the target drive pattern in a memory;
- (b) receiving an input signal indicating an error from a nominal value in at least one operating parameter, which error will result in use of the target drive pattern producing a discrepancy between the target array pattern and an actual array pattern deposited; and
- (c) deriving a corrected drive pattern from the target drive pattern such that use of the corrected drive pattern results in a reduced discrepancy between the target and actual array patterns.

45. A computer program product according to claim 44, wherein the program additionally performs the step of operating the apparatus according to the corrected drive pattern.

09359567 07330

Add #5

Add B5